Safety Data Sheet (US)

1. Identification

Product Identifier:	Isobutane
Other Means of Identification:	Iso-butane, i-Butane, Tert-butane, 1,1-Dimethylethane, Trimethylmethane, 2-Methylpropane, L.P.G. (Liquefied Petroleum Gas), R600, R600a
Product use:	Fuel, refrigerant, aerosol propellant, feedstock for production of petrochemicals (e.g. isooctane)
Restrictions on use:	Do not use for purposes other than those listed above
Manufacturer:	Keyera and Affiliates
Address:	Suite 600, Sunlife Plaza West 144 – 4th Avenue SW Calgary, AB, T2P 3N4
SDS Information:	1-780-449-7910
Emergency Contact (24 hours):	1-613-996-6666 (CANUTEC, Canada) 1-800-424-9300 (CHEMTREC, U.S.)

2. Hazards Identification

GHS Hazards

Pictogram	Classification	Hazard Statements
	Flammable Gases – Category 1	Extremely flammable gas
	Gases Under Pressure – Liquefied Gas	Contains gas under pressure; may explode if heated.
	Specific Target Organ Toxicity, Single Exposure – Category 2	May cause damage to heart.
	Specific Target Organ Toxicity, Single Exposure – Category 3	May cause drowsiness or dizziness.
No pictogram	Simple Asphyxiant	May displace oxygen and cause rapid suffocation.

Other Hazards

- May cause frostbite upon sudden release of liquefied gas.

Signal Word: Danger

Precautionary Statements:

Prevention

- Keep away from heat/sparks/open flames/hot surfaces – No smoking.
- Do not breathe vapors.
- Do not eat, drink or smoke when using this product.
- Use only outdoors or in a well-ventilated area.

Response

- Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
- Eliminate all ignition sources if safe to do so.
- If inhaled: Remove person to fresh air and keep comfortable for breathing.
- If exposed or concerned: Call a doctor/physician.
- Call a doctor/physician if you feel unwell.

Storage

- Protect from sunlight.
- Store in a well-ventilated place. Keep container tightly closed.
- Store locked up.

Disposal

- Dispose of contents/container in accordance with applicable local, provincial/state, and federal regulations.

3. Composition/Information on Ingredients

Chemical Name: Isobutane

Common Name/Synonyms: Iso-butane, i-Butane, Tert-butane, 1,1-Dimethylethane, Trimethylmethane, 2-Methylpropane, L.P.G. (Liquefied Petroleum Gas), R600, R600a

Ingredient Name	Volume %	CAS No.
Propane	1 - 2	74-98-6
1-Butene, iso-Butene, cis-Butene, trans-Butene	0.5 - 0.9	106-98-9, 115-11-7 107-01-7, 624-64-6
Isobutane	97 - 98	75-28-5
n-Butane	0.1 - 1	106-97-8

4. First Aid Measures

Immediate Medical Attention and Special Treatment:
Treat symptomatically and supportively. Refer also to Table below.

First Aid:	
Inhalation:	Remove person to fresh air and keep comfortable for breathing. If exposed or concerned: Call a doctor/physician. Call a doctor/physician if you feel unwell.
Skin:	If cold, liquefied isobutane is on skin (or hair): take off immediately all contaminated clothing. Rinse skin with water/shower. If skin irritation occurs: get medical advice/attention.
Eyes:	Rinse cautiously with water for several minutes. If eye irritation persists: get medical advice/attention.
Ingestion:	Not expected to be a route of exposure. See below.

Most Important Effects and Symptoms, Acute or Delayed:		
Exposure Route	**Health Effects**	**Symptoms of Exposure**
Inhalation:	Isobutane is not classified as an **asphyxiant**, but can act as one by depleting the concentration of oxygen in air.	Loss of consciousness, death.
Skin:	Sudden release of liquefied gas may cause burn or frostbite.	numbness, cold or burning sensation, white, pale, greyish-yellow or red skin, blistering in severe cases.
Ingestion	In VSA (Volatile Solvent Abuse) case, when directly spraying butane into the throat the butane jet can rapidly cool to -20C by expansion, causing prolonged laryngospasm (uncontrolled muscular contraction of the laryngeal cords) and “Sudden Sniffer’s Death” from cardiac arrest.	Loss of consciousness, death.

5. Fire Fighting Measures

Flammability: Yes. Isobutane, liquefied or in gas form, are highly flammable.	**Hazardous Combustion Products:** Carbon monoxide (CO), carbon dioxide (CO_2), and acrid smoke.
Explosion: Sensitive to impact: No	**Sensitive to static discharge:** Yes

Extinguishing Media:
Small Fire: dry chemical or CO_2.
Large Fire: water spray or fog.

Unsuitable Extinguishing Media:

- Foam.
- Water jet: Do not direct water at source of leak, especially with LPG to avoid icing.

Special Protective Equipment for Firefighters:

- Wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full face-piece.
- Wear thermal protective clothing when the fire involves liquefied isobutane.

Precautions for Firefighters:

- **DO NOT EXTINIGUISH A LEAKING GAS FIRE UNLESS THE LEAK CAN BE STOPPED.**
- If tank, rail car or tank truck is involved in a fire, ISOLATE and consider initial evacuation in all directions for 1600 meters (1 mile).
- Move container from fire area if you can do it without risk.
- Apply cooling water to sides of containers exposed to flames until well after fire is out.
- Cool fire-exposed containers with flooding quantities of water applied from as far a distance as possible.
- Stay away from ends of tanks.
- Containers exposed to fire may explode or vent through pressure-relief devices.
- Refer to Guide 115 of the Emergency Response Guidebook (Transport Canada/US Dept. of Transportation).

Unusual Fire and Explosion Hazards:

- The highly flammable vapors are heavier than air and may accumulate in low areas and /or spread along ground to distant ignition sources and flash back.

6. Accidental Release Measures

Protective Equipment:

Gloves:	Recommended: neoprene and nitrile. Not recommended: polyvinyl chloride PVC.
Clothing:	Flame-retardant coverall e.g. Nomex, Proban. Protective apron and trousers worn over coveralls for handling liquefied butane.
Respirator:	NIOSH Approved Supplied-Air Respirator or SCBA where large butane concentration is anticipated, and the exposure level is unknown or where an oxygen-deficient atmosphere may exist.
Eye:	Safety glasses with side shields, safety goggles or face shields.

Large spills: wear full protective clothing and NIOSH-approved SCBA with full face-piece.

Precautions:

- Direct addition of water to liquefied gas will cause flash vaporization resulting in an explosion (either immediately or delayed) known as a "boiling liquid, expanding vapor explosion (BLEVE)".
- Do not breathe vapors.
- Do not touch spilled liquefied isobutane with bare skin to avoid frostbite/freeze burn.
- Liquefied isobutane is still highly flammable: must be kept from sparks, open flame, hot surfaces, and all sources of ignition and heat.
- The highly flammable vapors are heavier than air and may accumulate in low areas and /or spread along ground to distant ignition sources and flash back.

Emergency Procedures:

- Shut off leak/release source, if it can be done safely.
- Remove all sources of ignition.
- Isolate hazard area.
- Evacuate area of all unnecessary personnel.
  Small spill: will evaporate.
  Large spill: consider downwind evacuation of at least 800 meters (½ mile.)
  If tank, rail car or tank truck is involved in a fire, ISOLATE and consider initial evacuation in all directions for 1600 meters (1 mile).
- Keep unnecessary and unprotected personnel from entering.
- Emergency personnel must wear appropriate personal protective equipment.
- Ventilate area of leak or spill.
- If possible, turn leaking LPG containers so that gas escapes instead if liquid.

Containment and Clean-up:

- Use non-sparking tools and equipment.
- Contain and recover liquid if it can be done safely: Collect spillage with an inert material (e.g., vermiculite, dry sand, earth), and place in metal container which can be grounded.
- Do not use combustible materials, such as sawdust, as absorbent.
- If a leak or spill has not ignited, use water spray to disperse the vapors or divert vapor cloud draft. Do not direct water at spill or source of leak.
- Prevent vapors or LPG from spreading to sewers, ventilation systems, confined spaces.
- Dispose of contents/container in accordance with applicable local, provincial/state, and federal regulations.
- Refer to Guide 115 of the Emergency Response Guidebook (Transport Canada/US Dept. of Transportation).

7. Handling and Storage

Handling Precautions :

- Use only outdoors or in a well-ventilated area.
- Keep away from heat/sparks/open flames/hot surfaces – No smoking.
- Do not breathe vapors.
- Do not eat, drink or smoke when using this product.
- Use non-sparking tools and equipment.
- Wear protective gloves/ protective clothing/ eye protection/ face protection when handling liquefied butane.

Storage Precautions:

Locations

- Store in a cool, dry, well-ventilated location, away from any area of fire-hazard.
- Outside or detached storage is preferred.
- Storage and use areas should be No Smoking areas.
- Store locked-up.

Containers

- Keep container tightly closed.
- Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause injury or death

.

Other precautions

- Separate from incompatibles like oxidizers e.g. chlorine gas and oxygen.

8. Exposure Controls / Personal Protection

EXPOSURE LIMITS

	Authority	15 MINS STEL or Ceiling	8-HOURS
Propane (CAS 74-98-6)	OSHA PEL	-	1000 ppm (1800 mg/m^3)
	ACGIH TLV	Identified as an asphyxiant	
	NIOSH	-	1000 ppm (1800 mg/m^3)
Butane (all isomers)	OSHA PEL	-	-
	ACGIH TLV	1000 ppm (2370 mg/m^3)	-
	NIOSH	-	800 ppm (1900 mg/m^3)

L.P.G. (Liquefied Petroleum Gas) (CAS 68476-85-7)	OSHA/NIOSH: IDLH, 2100 ppm Because L.P.G. may cause asphyxia at concentrations well above the lower explosive limit (LEL), the revised IDLH for L.P.G. is 2,000 ppm based strictly on safety considerations (i.e., being about 10% of the LELs of 1.9% for butane and 2.1% for propane).

ENGINEERING CONTROLS

- Ventilate area where product is used, stored and/or handled to maintain airborne concentrations below the LEL and OEL, especially in confined spaces.
- Exhaust/ventilate to the outside.
- Ventilation equipment must be explosion proof.
- Ventilation system should be grounded and separate from other exhaust ventilation systems. Adequate make-up air must be provided.

PERSONAL PROTECTIVE EQUIPMENT

Gloves:	Recommended: neoprene and nitrile; Not recommended: polyvinyl chloride PVC.
Clothing:	Flame-retardant coverall e.g. Nomex, Proban. Protective apron and trousers worn over coveralls for handling liquefied isobutane.
Respirator:	NIOSH Approved Supplied-Air Respirator or SCBA where large butane concentration is anticipated, and the exposure level is unknown or where an oxygen-deficient atmosphere may exist.
Eye:	Safety glasses with side shields, safety goggles or face shields.

9. Physical and Chemical Properties

Chemical Formula: C_4H_{10} or $(CH_3)_2CHCH_3$	**Molecular Weight:** 58.12 g/mole	**Chemical Family:** Hydrocarbon
Appearance: Colorless gas	**Odor:** Slight gasoline odor	**Odor Threshold:** Unknown
pH: Not applicable	**Melting/Freezing Point:** -160°C (-256°F)	**Boiling Point:** -11.7°C (10.9°F)
Flash Point: <-60°C (-76°F) Closed Cup	**Flammability:** Yes	**Evaporation Rate:** >1 (Butyl Acetate = 1)
Upper-Lower Explosive Limit: 1.8% (LEL), 8.4% (UEL)	**Vapor Pressure:** ~ 60 psig @38°C/100°F	**Vapor Density:** ~2 (air = 1)
Specific Gravity: Liquid 0.562	**Soluble in water (@20°C):** Slightly soluble ~50-60 mg/L	**Percent Volatile:** 100 by volume
Partition Coefficient n-octanol/water: Log Kow = 2.88	**Auto-Ignition Temperature:** 460°C (860°F)	**Decomposition Temp.:** Not available
Viscosity: Not available	**Henry's Law Constant:** Not available	**Isobaric Heat Capacity C_p:** Gas, 0.0984 kJ/mol-K @1.013 bar & 25°C/77°F

10. Stability and Reactivity

Reactivity:
Avoid incompatible materials: may react violently with oxidizers.

Chemical Stability:
Stable under normal temperatures and pressures.

Possibility of Hazardous Reactions:
Polymerization has not been reported to occur under normal temperature and pressure conditions.

Conditions to Avoid:
Extreme temperatures and incompatible materials.

Incompatible Materials:
- Oxidizers: may react violently with oxidizers including chlorine gas and oxygen.

Hazardous Decomposition Products:
- No decomposition if stored and applied as directed.
- Combustion forms carbon monoxide, carbon dioxide, irritating and toxic fumes/gases.

11. Toxicological Information

Exposure Route	Acute Health Effects	Symptoms of Exposure
Inhalation:	Effects on the Central Nervous system (CNS) at >1% (10,000ppm) may range from mild (respiratory depression) to severe (asphyxiation).	may range from rapid breathing, dizziness to respiratory arrest, loss of consciousness (narcosis) and death in extreme cases.
Skin:	In gas form: no known effects.	-
	In liquid form: burn or frostbite.	numbness, cold or burning sensation, white, pale, greyish-yellow or red skin, blistering in severe cases.
Eye:	In gas form: no known effects.	-
	In liquid form: burn or frostbite.	numbness, cold or burning sensation, blistering to blindness in severe cases.
Ingestion:	Not expected to be a route of exposure. In VSA (Volatile Solvent Abuse) case, when directly spraying butane into the throat the butane jet can rapidly cool to -20C by expansion, causing prolonged laryngospasm (uncontrolled muscular contraction of the laryngeal cords) and "Sudden Sniffer's Death" from cardiac arrest.	

Chronic Exposure:

Inhalation:
Repeated or prolonged exposure may cause damage to the Central Nervous System (CNS), the nervous and the heart system.

Skin:
Not known to be a skin-sensitizer. Repeated and prolonged contact may cause dry, red, cracked skin (dermatitis).

Medical Conditions Aggravated by Exposure:
Possibly asthma.

Sensitization:	**Reproductive Toxicology:**	**Teratogenicity:**	**Mutagenicity:**
No	No	No	No
Carcinogenicity: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA	**Irritancy:** No	**Target Organs:** Central Nervous System (CNS), nervous and heart system	

Lethality Tests:

Chemical Name	CAS No.	LC50 or LD50
Propane	74-98-6	Rat, inhalation: >800000ppm, 15-mins (oxygen was also added to maintain a level of ~20vol%)
		Rat, inhalation: 658 mg/L 4hrs.
n-Butane	106-97-8	Rat, inhalation: 658 mg/L 4hrs.
Iso-butane	72-28-5	Rat, inhalation: 658 mg/L 4hrs.

12. Ecological Information

Persistence & Degradability: Not expected to persist in the environment. Isobutane is expected to undergo biodegradation in soil.	**Bioaccumulative Potential:** Not expected to bioaccumulate.
Mobility: When released to soil, iso-butane is expected to have a high mobility (partition coefficient organic carbon to water, Koc = ~35).	**Other Adverse Effects:** See below.

Terrestrial Fate:

- Volatilization from soil surfaces is expected to be an important fate process, based upon an estimated Henry's Law constant of 0.95 – 1.19 atm-cu m/mole.
- Photolysis and hydrolysis are not expected to be important in soil.
- Groundwater contamination is not expected.

Aquatic Fate:

- Isobutane is only slightly soluble in water. Spills will spread on the water surface and the majority will evaporate. Estimated volatilization half-lives for a model river and model lake are 2 hours and 3 days, respectively.
- Hydrolysis is not expected to be an important environmental fate process since isobutane lacks functional groups that hydrolyze under environmental conditions.

Atmospheric Fate:

- If released to air, isobutane will exist solely as gas in the atmosphere.
- Isobutane is not expected to be susceptible to direct photolysis by sunlight, but will be degraded in the atmosphere by reacting with hydroxyl radicals.
- Isobutane also has the potential to partake in photochemical reactions to produce ozone pollutant.

Eco Toxicity Tests:

- Not available.

13. Disposal Considerations

Waste Disposal:

- Dispose of waste material at an approved waste treatment/disposal facility in accordance with applicable local, provincial, and federal regulations.
- Excess/waste isobutane can be disposed by incineration in a waste gas incinerator or flare.
- Isobutane can also be reused as fuel for boilers and heaters.

14. Transport Information

DOT (U.S.) CLASSIFICATION

(domestic transport only)
PROPER SHIPPING NAME: Isobutane
CLASS: 2.1 **UN NUMBER:** UN1969
PACKING GROUP: None **LABEL/PLACARD:**

OR

PROPER SHIPPING NAME: Liquefied Petroleum Gas
CLASS: 2.1 **UN NUMBER:** UN1075
PACKING GROUP: None **LABEL/PLACARD:**

MARINE POLLUTANT: No

15. Regulatory Information

UNITED STATES

Regulatory List	Chemical
TSCA: Toxic Substance Control Act Inventory List	Propane, n-Butane, Isobutane
CCA: Clean Air Act – Accidental Release Prevention – Flammable Substances (1000 lb. threshold quantity)	Propane, n-Butane, Isobutane

16. Other Information

NFPA Hazard Rating:
Health 1, Flammability 4, Instability 0

Prepared for:	Keyera Health and Safety
Issue Date/ Revision No:	August 31, 2015/ Revision 2

Revisions:	**Dates:**	**Main Changes**
• Original:	December 31, 2014	US GHS format
• 1st revision	June 30, 2015	Re-formatted
• 2nd revision	August 31, 2015	Changed emergency contact nummber

Glossary

ACGIH – American Conference of Governmental Industrial Hygiene
DOT – US Department of Transportation
IARC – International Agency for Research on Cancer
IDLH – Immediately Dangerous to Life and Health
NIOSH – National Institute for Occupational Safety & Health
NTP – National Toxicology Program
OSHA – Occupational Safety & Health Administration of the US Depart of Labour
PEL – Permissible Exposure Limit
SARA – Superfund Amendments and Reauthorization Act of 1986
SCBA – Self-Contained Breathing Apparatus
STEL – Short Term Exposure Limit
TRI – US Toxic Release Inventory
TSCA – Toxic Substance Control Act
TWA – Time Weighed Average

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~ End of Safety Data Sheet ~